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(54) Title: A METHOD FOR MANUFACTURING A DIAMOND COMPOSITE

(57) Abstract: The present invention relates to a method for manufacturing a diamond composite, comprising the steps of: a) mixing diamonds with additives, the mixture comprising at least 50 wt% and less than 95 wt% of diamonds and more than 5 wt% additives; b) forming a work piece from the mixture using a pressure of at least 100 Mpa; c) heating the formed work piece to at least 300°C for removing possible water and wholly or partially removing additives; d) heating the work piece and controlling the heating temperature and heatin time so that a certain desired amount of graphite is created by graphitization of diamonds, wherein the amount of graphite created by graphitization is 3-50 wt% of the amount of diamond; e) infiltrating silicon or silicon alloy into the work piece, the infiltration of silicon or silicon alloy being performed at a temperature below 1900°C and a pressure less than 50 bars; and f) heating the infiltrated work piece to form silicon carbide, or other carbides, (and silicides), thereby creating a final diamond composite.

WO 2004/089850 A3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/B/2004/050367

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C04B35/573 C04B41/50 C04B35/52 C22C26/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C04B C22C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 179 886 B1 (DANCHUKOVA LIJA VLADIMIROVNA ET AL) 30 January 2001 (2001-01-30) cited in the application example 1	1-10
A	----- WO 00/18702 A (FRENTON LTD ; SCIENT RESEARCH CENTER AMT OF (RU) ; GORDEEV SERGEY K (RU) 6 April 2000 (2000-04-06) cited in the application example 1	1-10
A	----- US 6 447 852 B1 (DANCHUKOVA LIJA VLADIMIROVNA ET AL) 10 September 2002 (2002-09-10) example 1 ----- -/-	1-10

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search

9 August 2004

Date of mailing of the international search report

11. 8. 04

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/2004/050367

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 453 951 A (OHNO JOHN M) 12 June 1984 (1984-06-12) column 3, line 24 - column 4, line 17; claim 1 -----	1-10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2004/050367

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1 - 10

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-10

Method for manufacturing a diamond composite and use of this method for forming a substrate suitable for a diamond film.

2. claim: 11

A diamond composite obtainable by the method according to claim 1 wherein one side of the composite is coated with a thin layer of aluminium nitride.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/E 004/050367

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6179886	B1	30-01-2001	
		RU 2147508 C1	20-04-2000
		RU 2131805 C1	20-06-1999
		RU 2151126 C1	20-06-2000
		RU 2147509 C1	20-04-2000
		AU 8975798 A	29-03-1999
		BR 9811633 A	26-09-2000
		CN 1125793 B	29-10-2003
		WO 9912866 A1	18-03-1999
		EP 1019337 A1	19-07-2000
		AT 224858 T	15-10-2002
		AU 749202 B2	20-06-2002
		CA 2301775 A1	18-03-1999
		CZ 20000613 A3	12-12-2001
		DE 69808324 D1	31-10-2002
		DE 69808324 T2	22-05-2003
		EA 3437 B1	24-04-2003
		EP 1253123 A1	30-10-2002
		ES 2187055 T3	16-05-2003
		HK 1030767 A1	02-07-2004
		JP 2001515836 T	25-09-2001
		PL 339012 A1	04-12-2000
		AT 229486 T	15-12-2002
		AU 9623098 A	29-03-1999
		BR 9811635 A	08-08-2000
		CA 2301611 A1	18-03-1999
		CN 1272100 T	01-11-2000
		CZ 20000724 A3	12-12-2001
		DE 69810141 D1	23-01-2003
		DE 69810141 T2	11-03-2004
		EA 1843 B1	27-08-2001
		WO 9912867 A1	18-03-1999
		EP 1019338 A1	19-07-2000
		ES 2190814 T3	16-08-2003
		JP 2001515927 T	25-09-2001
		PL 339060 A1	04-12-2000
WO 0018702	A	06-04-2000	
		RU 2147982 C1	27-04-2000
		RU 2151814 C1	27-06-2000
		AT 218520 T	15-06-2002
		AU 759804 B2	01-05-2003
		AU 3811699 A	17-04-2000
		BR 9914094 A	12-06-2001
		CA 2342986 A1	06-04-2000
		CN 1320108 T	31-10-2001
		DE 69901723 D1	11-07-2002
		DE 69901723 T2	13-02-2003
		EA 3715 B1	28-08-2003
		WO 0018702 A1	06-04-2000
		EP 1117625 A1	25-07-2001
		ES 2182517 T3	01-03-2003
		JP 2002525262 T	13-08-2002
		US 6709747 B1	23-03-2004
US 6447852	B1	10-09-2002	US 6709747 B1 23-03-2004
US 4453951	A	12-06-1984	
		AU 7919782 A	29-07-1982
		EP 0056945 A1	04-08-1982
		JP 57135780 A	21-08-1982

INTERNATIONAL SEARCH REPORT

International Application No

PCT/E 004/050367

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4453951	A	ZA 8200101 A	24-11-1982
		AT 13046 T	15-05-1985
		AU 7255381 A	14-01-1982
		BR 8108689 A	25-05-1982
		CA 1171249 A1	24-07-1984
		DE 3170267 D1	05-06-1985
		EP 0043542 A1	13-01-1982
		JP 57501027 T	10-06-1982
		WO 8200138 A1	21-01-1982
		US 4428755 A	31-01-1984
		ZA 8104403 A	27-10-1982